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# United States Patent Application For

## EXPANSION MOTOR

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### Background of the invention

In manufacturing, engineering and scientific work often it is needed to clamp, or manipulate parts, or control a gap space between them. Arrays of devices are used to manipulate parts so new features can be created with proper relationship to existing features when machining parts. In power transmission trains shafts are coupled and pulleys are clamped in place. Optical alignment sometimes requires alignment in angstroms to split light beams. Before mentioned are some of tasks that deal with clearances or clamping ranges few thousands of an inch or millimeters. This work requires this excursion of a movable feature of these devices to be controlled within this barely visible range. In some instances as with a brake or clutch the movement is practically non measurable as a preload is being applied. That is, pressure on contacting surfaces is increased or decreased as with a brakes and clutches. Another example of micro inch movement is with the displacement of the mounting of variable stiffness hydraulic dampeners.

These type clamping is disclosed in an early example using an expandable sleeve is in U.S. Pat. No. 4,366,735 U.S. and later Pat. No. 6,077,003 each using seals of various materials. Other chucks and holding devices are shown by U.S. Pat. No. 5,127,780 and U.S. Pat. No. US 6,488,285 B1. A shortcoming of the gripping sleeves is that the preload on the compressible seals is reduced as the pressure expands or reduces the removable wall. Therefore, the increasing the hydraulic pressure reduces the sealing. Melted copper seals delaminate and fail under torsion loads. Also, highly stressed fusible alloy welds also fail with the internal pressures of cooling metals. An example of a device for positioning is U.S. Pat. No. 5,362,185 showing is a widening elastic rod. A fluid under elastic membrane is shown in U.S. Pat. No. 6,375,172.

Summary and objects of the invention